In Vivo Imaging for the Detection and Quantitation of Transplanted Stem/Progenitor Cells in Nonhuman Primates

Grant Award Details

In Vivo Imaging for the Detection and Quantitation of Transplanted Stem/Progenitor Cells in Nonhuman Primates

Grant Type: Tools and Technologies I

Grant Number: RT1-01019

Investigator:

Name:	Alice Tarantal
Institution:	University of California, Davis
Type:	PI

Human Stem Cell Use: Adult Stem Cell

Award Value: $799,350

Status: Closed

Progress Reports

Reporting Period: Year 1

View Report

Reporting Period: Year 2

View Report

Reporting Period: NCE

View Report

Grant Application Details

Application Title: In Vivo Imaging for the Detection and Quantitation of Transplanted Stem/Progenitor Cells in Nonhuman Primates

Public Abstract:

Stem cells hold great potential for treating a variety of human diseases, but more information is needed on how they will function once administered to patients for regenerative medicine purposes. If imaging techniques can be developed that allow the monitoring of these transplanted stem and progenitor cells over time once injected into the body, this would provide a very powerful tool to determine the fate of the cells. This proposal specifically addresses new ways to optimize the use of positron emission tomography (PET), an imaging technology currently used in the human clinical setting, for this purpose. PET is an imaging technique that produces a three-dimensional image by detection of a tracer or label that has been introduced into the body. In these studies we plan to optimize these imaging techniques when a special tag or label is attached to individual stem and progenitor cells, and address the sensitivity of the scanner for their detection. An important goal is to improve the ability to detect the small quantities of cells that may be used, and ensure that the images obtained can accurately identify the number of cells at any given location. Several factors limit the ability to detect the cells reliably in current PET scanners. These limitations include an inherent background signal which alters the ability to accurately identify the cells injected. In addition, processing of the information obtained by the PET imaging system has not been optimized for monitoring transplanted cells where the cell quantity may be very small and the tag or label used to find the cells may be difficult to detect. Further, the methods used to place the tag or label on the cells needs to balance the requirements for obtaining good imaging information without damaging the cells or altering their capabilities in the labeling process. Our plan is to investigate these crucial issues and current roadblocks in the context of stem cell imaging with the goal of substantially advancing the imaging field for stem cell therapies. We will use model systems to ensure that the techniques and applications developed and proposed for human use are safe and do not cause harm to patients of all age groups. These studies will focus on optimizing PET imaging techniques for cell quantification and identification, and develop and refine new ways to monitor cells, including those differentiated from human embryonic stem cells, for short and extended periods of time.

Statement of Benefit to California:

This proposal meets the objective of CIRM RFA 08-02 by providing new ways to overcome current gaps and roadblocks for sensitive imaging methods that would allow the detection of stem and progenitor cells administered to patients for regenerative medicine purposes. These new tools and technologies will serve the State of California and its citizens by providing reliable techniques for any scientist or physician to assess their ideas and new cell transplant protocols before considering use in human patients. Once tested and shown to be effective, these same imaging techniques can then be used in human patients. While stem cells, particularly human embryonic stem cells, have tremendous potential for treating a variety of human diseases, many questions remain about their safety and outcome once they are used. If imaging techniques can be developed that allows the monitoring of the cells over time, this would provide a very powerful tool to determine the fate of the cells after injection into patients. The results of these studies will fill a critical need and substantially advance the regenerative medicine field for a host of human diseases for which there are currently few therapeutic options.
